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Complying with Step 1 of the BC Energy Step Code for Part 9 Buildings

This bulletin clarifies the purpose of Step 1 and provides suggestions to assist building officials, Energy Advisors and builders working on Step 1 buildings. It is part of a series of three bulletins about the BC Energy Step Code that includes:

- B19 – 02: Step 1 in the BC Energy Step Code: Airtightness, Enhanced Compliance and Compliance Paths, and
- B19 – 03: Guidelines for Energy Advisors – Setting Airtightness Values for Energy Modelling of Part 9 Buildings for Compliance with the BC Energy Step Code.

Bulletin B18 – 03 (released July 2018) is a companion bulletin that provides information on the BC Energy Compliance Reports - Performance Paths for Part 9 Buildings.

What is the BC Energy Step Code?

The BC Energy Step Code is an optional performance-based compliance path in the BC Building Code (BCBC). For Part 9 buildings, it applies to residential occupancies only. Local governments may use the BC Energy Step Code, if they wish, to incentivize or require a level of energy efficiency in new construction above the requirements of the base BCBC.

What is Step 1 of the BC Energy Step Code and How is it Achieved?

Achieving Step 1 of the BC Energy Step Code requires understanding how buildings comply with the BC Building Code (BCBC). Traditionally, builders complied with the BCBC by following the BCBC's prescriptive requirements. To improve flexibility and achieve desired outcomes, building codes have begun to move towards performance-based compliance. With this approach, codes specify the designed performance the building must achieve, and the building team determines how to achieve the performance level.

A building constructed to Step 1 is intended to have as good or better energy performance as a reference building constructed to the BCBC's minimum prescriptive requirements for energy efficiency in Subsections 9.36.2. through 9.36.4. As such, Step 1 of the BC Energy Step Code is intended to help builders familiar with traditional prescriptive codes make a smooth transition to building to performance codes that are focused on outcomes.

To comply with Step 1 of the BC Energy Step Code for Part 9 buildings, the builder is required to do the following:

At the Building Permit Application stage:

- Submit an energy model of the building. The energy model can be created either in accordance with Natural Resources Canada's (NRCan) EnerGuide Rating System (ERS) by an Energy Advisor¹ qualified by NRCan, or in accordance with the requirements of Subsection 9.36.5. by an energy modeller. To comply with Step 1 of the BC Energy Step Code, builders must submit a proposed house² energy model demonstrating that the building's energy performance will be no worse than a reference house.³ The airtightness value of the proposed house is determined by following the guidance in Bulletin B19 – 03.
- Local building departments may require the submission of Pre-Construction BC Energy Compliance Report, described in Bulletin B18 – 03 and developed based on the requirements in Division C, Subsection 2.2.8. of the BC Building Code.
- The building plans, building energy model and Pre-Construction Compliance Report must all be consistent with each other.

At building completion (see Table 1 below):

- Conduct a blower door test to assess the airtightness of the building. This airtightness score must be reported to the Authority Having Jurisdiction (AHJ). In the ERS compliance path, the airtightness value must be incorporated into the as-built energy model, which is used to determine whether the Step 1 targets have been achieved. Under the Subsection 9.36.5. compliance path, there is no requirement to incorporate the airtightness test result into the as-built energy model. This is discussed further in Bulletin B19 – 02.
- Submit an energy model of the building as constructed, produced by an Energy Advisor or an energy modeler. This model must show that the completed building has an energy performance as well or better than the reference house.
- Local building departments may require the submission of an As-Built BC Energy Compliance Report, a companion report to the Pre-Construction Report submitted at Building Permit Application stage.

¹ An Energy Advisor, in the context of this Bulletin, is "an individual registered with Natural Resources Canada to deliver the EnerGuide Rating System Basic Service and additional services," as per NRCan's "EnerGuide Rating System Standard Version 15.6," p. 6. The term energy modellers is used in a generic sense in this Bulletin.

² The proposed house, in the context of energy modelling, is the house as designed, with standard operating conditions such as number of occupants, appliance and hot water loads, and operating schedules as defined either by HOT2000 or by Subsection 9.36.5.

³ An ERS reference house, according to the EnerGuide Rating System's HOT2000 User Guide, is a "copy of the (proposed) house with standard operating conditions. It is then manipulated to represent the modelled house as if it were built to the National Building Code of Canada (NBC) Section 9.36 energy-efficiency requirements." A Subsection 9.36.5. reference house shares many of the same properties as the reference house in the ERS, but is not identical to the Reference House referred to in the ERS. The differences are discussed further in Bulletin B19 – 02.

Table 1. Step 1 compliance requirements for ERS and Subsection 9.36.5. compliance paths.

Compliance Path	Building Energy Model Needed?	Airtightness Requirement		Performance Requirement of Building Equipment and Systems	Performance Requirement of Building Envelope
		Blower Door Test Needed?	Air Changes Per Hour at 50 Pa Pressure Differential (ACH ₅₀) for As-Built House		
ERS	☑	☑	As tested	Report % better than ERS v15 reference house	
9.36.5.	☑	☑	4.5 ACH ₅₀ , 3.5 ACH ₅₀ or as tested, as determined in Sentence 9.36.5.10.(9)*	Report % better than reference house of Articles 9.36.5.13. through 9.36.5.16.	

* For more details on which airtightness value should be used, see Bulletin B19 – 03.

The Importance of Airtightness

Airtight buildings are much more likely to have better energy performance and durability, and are more likely to comply with the BC Energy Step Code. While there is no minimum requirement for airtightness at Step 1 of the BC Energy Step Code, the reference house in both the ERS path and the Subsection 9.36.5. path assumes an airtightness of 2.5 ACH₅₀. A building that is designed to and achieves an airtightness of 2.5 ACH₅₀ may not need any upgrades relative to prescriptive code minimums. However, buildings modeled with a proposed airtightness higher than 2.5 ACH₅₀ will likely need to incorporate energy efficiency upgrades relative to prescriptive code minimums to achieve Step 1 of the BC Energy Step Code.

New buildings in British Columbia that have gone through the ERS between 2010 and mid-2018 averaged an airtightness of 4 ACH₅₀. Builders may find that their first building projects under the BC Energy Step Code will bring new challenges if they have not had their buildings tested for airtightness in prior projects. Builders new to airtightness testing should not assume they have been meeting the prescriptive expectation of 2.5 ACH₅₀ in the absence of data. Achieving 2.5 ACH₅₀ can be accomplished with attention to air barrier details, training and practice.

Information to Help Building Officials

There are two energy modelling compliance paths for Step 1 of the BC Energy Step Code: the ERS and Subsection 9.36.5. Subsection 9.36.5. is a no-fail compliance path. While both paths require airtightness testing and reporting of results, the results of this test are not required to be part of the energy modelling in the Subsection 9.36.5. path. The ERS offers quality assurance and quality control (QA/QC) procedures, which gives building officials greater confidence in submissions, while the Subsection 9.36.5. path does not.

The Energy Advisor modelling a building using the ERS has more flexibility to set an airtightness value for the proposed house than if they follow the Subsection 9.36.5. path, which

prescribes airtightness values for proposed houses. The reference house in both paths must be modelled at 2.5 ACH₅₀. More details can be found in Bulletin B19 – 03.

It may be challenging to meet the Step 1 energy performance requirements in the earliest projects if builders cannot achieve the airtightness values used in their proposed house energy models. The no-fail compliance path helps to avoid a bottleneck at the time of occupancy. Building teams will be able to learn from these early projects how to improve air barrier details, leading to improved airtightness performance in the medium term. For more details, see Bulletins B19 – 02 and B19 – 03.

AHJs may have different administrative requirements for the two compliance paths, and may seek further assurance that the building complies with the Code for a Subsection 9.36.5. submission. Examples include:

- Requiring builders to attend an airtightness course at their own time and expense;
- Requiring a professional engineer sign-off plans for a BC Energy Step Code building that follows Subsection 9.36.5., to provide further confidence to Local Governments that the model is compliant with the Code (though this may add additional cost); and
- Requiring mid-construction/pre-drywall blower door testing, in addition to post-completion airtightness testing.

Information to Help Energy Advisors and Energy Modellers

Energy Advisors and energy modellers should review Technical Bulletins B19 – 02 and B19 – 03 for guidance on achieving Step 1 and setting airtightness values for all Part 9 BC Energy Step Code buildings. They should consult with the building team about previous projects done by the builder and the builder's experience with improving building airtightness, as this can help determine the default airtightness values to use.

Energy Advisors should consider using airtightness values for the pre-construction models for buildings complying with the ERS path that are achievable for the building team, and support builders new to airtightness testing to help them identify cost-effective energy efficient building solutions. The Energy Advisor should work with the building team to identify additional energy efficiency measures when energy modelling to help meet the energy performance requirements, to compensate for the possibility of a proposed house air leakage rate that is higher than that of the reference house. This will help avoid an energy model at building completion that does not comply, causing delays or unexpected costs.

The building team should identify in advance how a local government will respond if they need to utilize Subsection 9.36.5. as a 'No Fail Step Code Compliance Path' should the ACH₅₀ result make it impossible to comply with Step 1 using the ERS, so they can prepare accordingly.

Information to Help Builders

A builder seeking to comply with the BC Energy Step Code should work with an Energy Advisor at the outset of a project to identify strategies to construct more airtight and energy efficient buildings. Building an airtight house with proper ventilation is often the most cost-effective way of meeting BC Energy Step Code requirements and reduces the number of other energy efficiency measures required. It also results in a more comfortable and durable home for future

occupants, with reduced risk of building envelope failure due to moisture problems from air leakage.

If the builder has not focused on meeting an airtightness requirement in previous projects, they may want to speak with building officials regarding the 'No Fail Step Code Compliance Path' option. If there is a possibility that airtightness may cause the building to fail the energy performance requirements of Step 1, the builder should review the options for complying using Subsection 9.36.5.

Resources for Airtightness

The following resources give more guidance on airtightness.

Illustrated Guide: Achieving Airtight Buildings - This BC Housing guide describes how to design, build and test airtight buildings, and is available online at <https://www.bchousing.org/research-centre/library/residential-design-construction/achieving-airtight-buildings>.

BC Energy Step Code Builder Guide – This BC Housing guide provides information on the key strategies and approaches that builders can use to meet the BC Energy Step Code for houses and low-rise (Part 3 and Part 9) wood-frame residential buildings up to six storeys. It is available online at <https://www.bchousing.org/research-centre/library/residential-design-construction/bc-energy-step-code-builder-guide&sortBy=sortByDate>.

BCIT's Airtightness Training Course – This one-day workshop covers airtightness from top to bottom in a day. It starts with a discussion of what an air barrier is and how to define it on a project, and then shifts to a hands-on workshop that details all aspects of how an air barrier is made. More information about the course is available online at <http://www.smallplanetsupply.com/vancouver-airtightness-1>.

Vendors – Vendors of air sealing products may offer training opportunities on the job site or in product-knowledge training sessions.

More Information

Please visit www.gov.bc.ca/buildingcodes or www.energystepcode.ca.

Questions related to this bulletin can be directed to CodeQuestion@gov.bc.ca.

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